

NAS74N (UNS S32750)

NAS High Corrosion Resistant Super Duplex Stainless Steel

NAS74N is a super duplex stainless steel with pitting resistance equivalent (PRE*) number higher than 40, which provides not only excellent corrosion resistance but also excellent strength properties. In particular, NAS74N has superior localized corrosion resistance compared with UNS S32205 (NAS329J3L, SUS329J3L), and UNS S32506 (NAS64, SUS329J4L). Therefore, NAS74N is used for those applications under severe environments such as chemical plants and desalination plants. Nippon Yakin supplies NAS74N in the form of plate, sheet and strip.

*PRE = %Cr + 3.3 × %Mo + 16 × %N

Steel Grade/Standard

NAS	JIS G4304/4305	ASTM A240	EN 10088-2/10028-7
NAS74N	SUS327L1	UNS S32750	1.4410

Chemical Composition

	C	Si	Mn	P	S	Ni	Cr	Mo	Cu	N	PRE
Specification (SUS327L1)	≤0.030	≤0.80	≤1.20	≤0.035	≤0.020	6.00~8.00	24.00~26.00	3.00~5.00	≤0.50	0.24~0.32	—
Specification (UNS S32750)	≤0.030	≤0.80	≤1.20	≤0.035	≤0.020	6.0~8.0	24.0~26.0	3.0~5.0	≤0.50	0.24~0.32	≥41
Specification** (EN 1.4410)	≤0.030	≤1.00	≤2.00	≤0.035	≤0.015	6.0~8.0	24.0~26.0	3.0~4.5	—	0.24~0.35	—

**EN 10088-2

Physical properties

Density	[g/cm ³]	7.80	
Specific heat	[J/kg · K]	453	
Electrical resistivity	[μΩ · cm]	83.0	
Thermal conductivity	[W/m · K]	12.3	
Average coefficient of thermal expansion	[10 ⁻⁶ /°C]	20~100°C	13.4
		20~200°C	13.7
		20~300°C	13.8
		20~400°C	14.0
Young's modulus	[MPa]	19.7 × 10 ⁴	
Magnetism		Y (magnetizable)	
Melting range	[°C]	1390~1455	

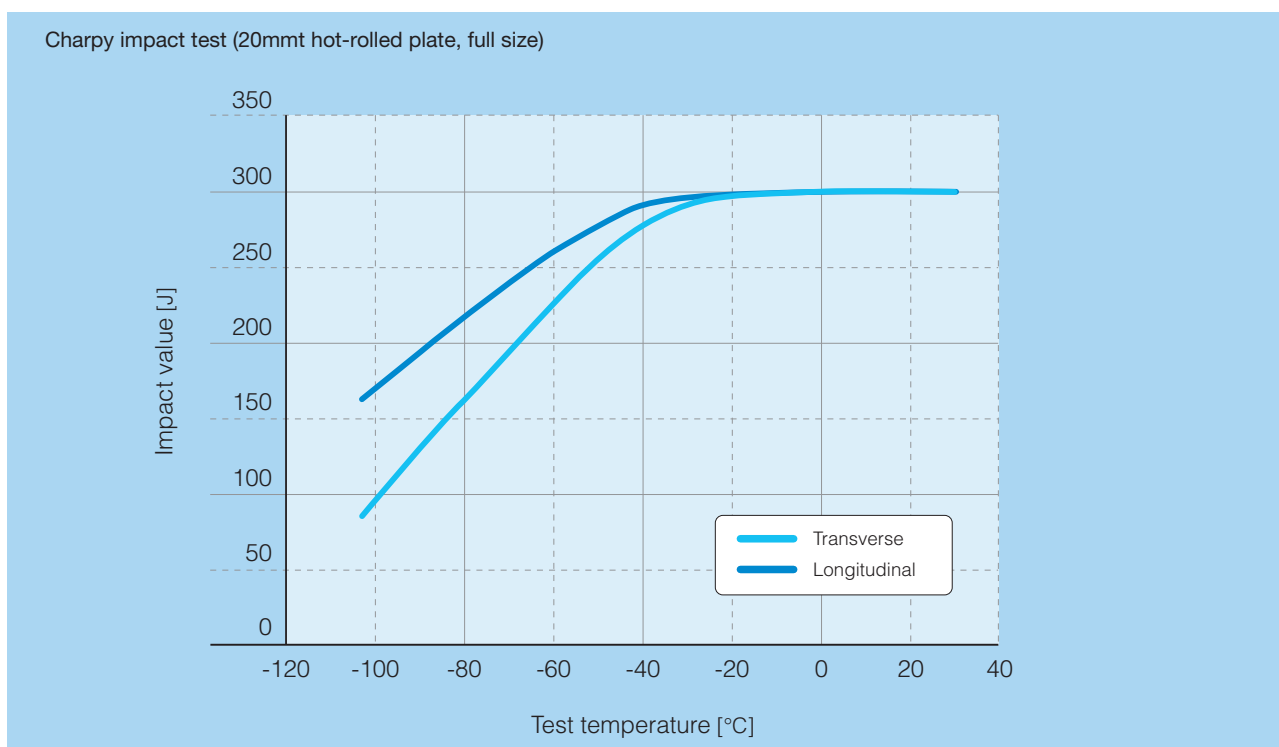
Mechanical Properties

Mechanical Properties at Room Temperature

		0.2% proof stress [MPa]	Tensile strength [MPa]	Elongation [%]	Hardness [HBW]	Impact Value R.T/Vnotch/Fullsize (J)	
Specification (SUS327L1)		≥ 550	≥ 795	≥ 15	≤ 310	—	—
Specification (UNS S32750)		≥ 550	≥ 795	≥ 15	≤ 310	—	—
Specification (EN 1.4410)*		≥ 530	730~930	≥ 20	—	≥ 100 (long)	≥ 60 (tr)
Example	Hot-rolled plate 20mm ^t	588	849	38	235	298	298
	Hot-rolled plate 8mm ^t	655	880	37	255	—	—

*EN 10088-2 hot rolled plate

Impact Value



Corrosion Resistance

NAS74N has excellent localized corrosion resistance (pitting corrosion, crevice corrosion) and acid resistance in comparison with Type 304, Type 316L, NAS329J3L (UNS S32205), NAS64 (UNS S32506).

Pitting Corrosion Resistance

Alloy	ASTM G48 Method A		ASTM G48 Method C
	22°C	50°C	Critical pitting corrosion temperature CPT (°C)
NAS329J3L	○	×	50
NAS64	○	○	55
NAS74N	○	○	70

Test conditions ASTM G48 Method A (○: No pitting corrosion, ×: Pitting corrosion)
 • Test solution: 6%FeCl₃
 • Test temperature: 22°C, 50°C (Recommended temperature in this test)
 • Test time: 72h

ASTM G48 Method C
 • Test solution: 6%FeCl₃ + 1%HCl
 • Test time: 72h

Crevice Corrosion Resistance

Alloy	ASTM G48 Method D	
	Critical crevice corrosion temperature CCT (°C)	
NAS329J3L	25	
NAS64	30	
NAS74N	45	

- Test conditions ASTM G48 Method D
- Test solution: 6%FeCl₃ + 1%HCl
 - Test time: 72h

Acid Resistance

Alloy	Corrosion rate in sulfuric acid at 80°C (mm/y)					
	5%	10%	20%	40%	60%	80%
NAS329J3L	0.01	0.17	4.65	365.9	1456	106.4
NAS64	<0.01	0.02	1.07	191.9	1054	60.72
NAS74N	0.02	0.02	1.30	79.91	548.6	99.53

Test time: 24h

Alloy	Corrosion rate in hydrochloric acid at 80°C (mm/y)			
	0.1%	1%	2%	3%
NAS329J3L	0.02	0.03	31.10	60.62
NAS64	0.01	0.01	12.94	30.51
NAS74N	0.01	0.01	0.01	44.75

Test time: 24h

Alloy	Corrosion rate in boiling phosphoric acid (mm/y)				Corrosion rate in boiling nitric acid (mm/y)		
	20%	40%	60%	80%	20%	40%	60%
NAS329J3L	0.03	0.06	3.96	5.52	0.02	0.04	0.11
NAS64	0.01	0.06	0.25	4.99	0.02	0.02	0.08
NAS74N	0.02	0.06	0.15	2.83	0.01	0.02	0.08

Test time: 24h

(Reference)

Alloy	JIS	UNS No.	Chemical composition
NAS329J3L	SUS329J3L	S32205	22Cr-5.3Ni-3.2Mo-0.16N
NAS64	SUS329J4L	S32506	25Cr-6.5Ni-3.3Mo-0.17N
NAS74N	SUS327L1	S32750	25Cr-7Ni-3.8Mo-0.27N

Workability

Attention should be paid for the strength behavior of NAS74N which abruptly increases below 1000°C in spite of the lower strength than Type 304 at high temperatures. Solution annealing should be carried out after hot working. Attention has to be also paid for the behavior of cold workability because of the higher proof stress along with the lower elongation than Type 304.

Weldability

Conventional welding processes including GTAW (TIG), GMAW (MIG/MA) can be used. Use of filler metals for UNS S32750 is recommended. Neither preheating nor post-weld heat treatment is necessary. Interpass temperature should be no more than 100°C in order to prevent precipitation of intermetallic compounds of σ phases that result in brittleness.

Heat Treatment

Solution annealing of NAS74N should be performed at the temperature range from 1025 to 1125°C. This should be followed by quick quench dipping into water or other alternative ways to according to ASTM A480/A480M leading to prevent brittleness by 475°C brittleness and σ phases.

Pickling

A mixture of nitric and fluoric acids is applied for pickling. In addition, due to its higher corrosion resistance, immersion into fused salt bath before pickling is significantly effective to take scale off. And further occasion shot blasting before pickling is extremely effective.

Applications

Chemical plant, Chemical tanker, Seawater desalination system, Seawater pump

Certification

It is possible to manufacture UNS S32750 in accordance with the NORSOK standard below. The thickness is up to 40mm.

- NORSOK M-650
- NORSOK M-630 MDS D55

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